Abstract

Electric Storage Augmentation of Fuel Cell System Transient Response

A fuel cell stack (7) with output lines (8, 9) has a bank of supercapacitors (10) or batteries (10a) connected across the output lines, either directly or through a DC/DC converter (22). The fuel cell stack receives fuel either from a reformer (13) or a source (13a) of hydrogen. Power is supplied through a power conditioning system (15) to a load (16), all under the control of a controller (19). The supercapacitors or batteries receive additional charge from excess power when there is a sudden decrease in the load, and provide charge to the output power lines (8, 9) when there is a sudden increase in load demand. In one embodiment, the voltage of the supercapacitors or batteries always follow the voltage of the fuel cell stack, thereby providing or receiving commensurate charge. With the DC/DC converter, the supercapacitors or batteries may be operated at voltages which are a multiple or a fraction of fuel cell stack voltage, and may have voltages boosted or bucked to aid in response to transients.